

CLAIMS

1. A dredger cuttertooth manipulator comprising at least one robotic tooth handler (64, 98), the manipulator comprising means for:
 - 5 1. removing a tooth (10) from a dredger cutterhead (36); and
 2. replacing the removed tooth (10) with a new tooth (48).
2. The manipulator of claim 1, comprising a hand (90) for gripping a worn tooth (10) and for removing the tooth from the cutterhead (36).
- 10 3. The manipulator of claim 1 or claim 2 comprising a hand (90) for gripping a new tooth (48) and for mounting the new tooth (48) onto the cutterhead (36).
4. The manipulator of claim 1, 2 or 3, wherein the teeth (10, 48) are for mounting on
 - 15 spigots (12) and are lockable to the spigots (12) each with a spigot pin (14) by extending the spigot pin (14) through the respective tooth (10, 48) and spigot (12).
5. The manipulator of claim 1, 2 or 3, wherein the teeth (10, 48) are for mounting on spigots (12) and are lockable to the spigots (12) each with a spigot pin (14) by fitting the
 - 20 spigot pin (14) at a side of the respective spigot (12) and tooth (10, 48).
6. The manipulator of claim 4 or 5, wherein the spigot pin (14) is provided from a spigot pin magazine.
- 25 7. The manipulator of claim 6, wherein the spigot pin magazine is held by a new tooth handling hand of the manipulator.
8. The manipulator of claim 1, 2 or 3, wherein the teeth (10, 48) are for mounting on spigots (12) with a tack-weld.
- 30 9. The manipulator of claim 1, 2, 3 or 7, wherein the teeth (10, 48) are for fitting on spigots (12) with adhesive.

10. The manipulator of any one of claims 4 to 9, wherein the spigots (12) are quarter-turn spiralled spigots.

11. The manipulator of claim 10, wherein the spigots (12) comprise a quarter-turn
5 thread.

12. The manipulator of any one of claims 4 to 11, wherein the spigot (12) is on a leading edge of an arm of the cutterhead (36).

10 13. The manipulator of any one of the preceding claims, comprising two robotic tooth handlers (64, 98).

14. The manipulator of claim 13, wherein a first robotic tooth handler (64) removes worn teeth (10) and a second robotic tooth handler (98) fits new teeth (48).
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15. The manipulator of any one of the preceding claims, comprising an optical position control system for manoeuvring the manipulator for removing and replacing teeth (10; 48) from and on a cutterhead (36).

20 16. The manipulator of any one of the preceding claims, comprising a hand fitted to a robotic tooth handler (98) for gripping a new tooth (48) from a supply (106) of new teeth (48) and for securing the new tooth (48) to the cutterhead (36).

17. The manipulator of claim 16, wherein the hand is provided on a second robotic
25 tooth handler (98).

18. The manipulator of any one of the preceding claims, the or each robotic tooth handler (64, 98) comprising a multi-axis robotic arm having a hand for engaging or gripping a tooth (10; 48).
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19. The manipulator of claim 18, wherein the or each hand is at the end of the or each arm.

20. The manipulator of any one of the preceding claims for retrofitting on a cutterplatform (32) of a dredger ship (24).
21. The manipulator of any one of the preceding claims, mounted on a damper to
5 isolate the manipulator from vibrations external of the manipulator.
22. The manipulator of claim 21, wherein the damper is provided with a clamp for selectively preventing the damper from functioning.
- 10 23. A dredger ship (24) comprising the manipulator of any one of the preceding claims, wherein the manipulator comprises two robotic tooth handlers (64, 98), the two robotic tooth handlers (64, 98) being mounted on opposed sides of a cutterplatform (32) of the dredger ship (24) for the cutterhead (36) to be hoisted into a position between the two robotic tooth handlers (64, 98) for tooth manipulation.